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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/888,612	06/26/2001	Toshimichi Tokuda	43890-527	8540

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EXAMINER	
VO, HUYEN X	
ART UNIT	**PAPER NUMBER**
2655	

DATE MAILED: 09/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/888,612	TOKUDA, TOSHIMICHI	
	Examiner	Art Unit	
	Huyen Vo	2655	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/26/2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmori et al. (US Patent No. 5950153) in view of Kudo et al. (US Patent No. 5579434), and further in view of Aguilar et al. (US Patent No. 6691082).

3. Regarding claims 1 and 7, Ohmori et al. disclose a device and method for audio frequency range expansion for generating a wide frequency band audio signal based on an input narrow frequency band audio signal comprising:

a) analog-to-digital converting means for sampling input analog narrow frequency band audio signal at a sampling frequency of substantially four times or more and even number multiple of upper limit frequency, and converting the signal into a digital signal (*Up-samplers 3 and 8 in figure 1 or referring to col. 4, ln. 1-23*),

b) voiced/voiceless judging means for analyzing the digital signal issued from said analog-to-digital converting means, and distinguishing a voiceless

sound section not including vowel from a voiced sound section including a vowel, in the audio signal (*Affricate Detecting Unit 7 in figure 1 or col. 4, ln. 15-43*),

e) signal converting means for converting a digital signal issued from said filter into an analog signal, and issuing an audio signal of wide frequency band (*the digital data at terminal 15 in figure 1 must inherently be converted to analog signal before it can be played to users*), and using voice/unvoiced information to control the gain of the signal (*elements 7 and 10 in figure 1*).

Ohmori et al. fail to specifically disclose the step of: c) aliasing signal generating means for disposing sampled signals on every relevant order of sample point of digital signals issued from said analog-to-digital converting means, replacing the value of the every relevant order of sample point spuriously with zero value, and generating a digital signal spuriously having frequency components of twice as high as the input frequency components of narrow frequency band audio signaland having a frequency spectrum folded the spectrum of the input signal symmetrically at the frequency axis which is the upper limit frequency of input audio signal, and d) a filter for limiting the band of the output signal of said aliasing signal generating means by changing over the low pass filter characteristic to a low cut-off frequency state for the voiced sound section and a high cut-off frequency state for the voiceless sound section, based on the judged result by said voiced/voiceless judging means.

However, Kudo et al. teach the step of: c) aliasing signal generating means for disposing sampled signals on every relevant order of sample point of digital signals issued from said analog-to-digital converting means, replacing the

value of the every relevant order of sample point spuriously with zero value, and generating a digital signal spuriously having frequency components of twice as high as the input frequency components of narrow frequency band audio signaland having a frequency spectrum folded the spectrum of the input signal symmetrically at the frequency axis which is the upper limit frequency of input audio signal (*col. 5, ln. 42 to col. 6, ln. 22*).

Since Ohmori et al. and Kudo et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Ohmori et al. by incorporating the teaching of Kudo et al. in order to reproduce a wideband signal having the original sampling frequency.

The modified Ohmori et al. still fail to teach step d) a filter for limiting the band of the output signal of said aliasing signal generating means by changing over the low pass filter characteristic to a low cut-off frequency state for the voiced sound section and a high cut-off frequency state for the voiceless sound section, based on the judged result by said voiced/voiceless judging means.

However, Aguilar et al. teach a method of controlling the cut of frequency of a filter based on the voice/unvoiced decision detected by the voice/unvoiced detection unit (*col. 4, ln. 45 to col. 5, ln. 21*).

Since the modified Ohmori et al. and Aguilar et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Ohmori et al. by incorporating the teaching of Aguilar et al. in order to precisely capture

and analyze voiced and unvoiced portions of the signal to enhance wideband speech quality.

4. Regarding claims 2 and 8, Ohmori et al. further disclose that the device for audio frequency range expansion of claim 1, further comprising: a low frequency expander for spuriously restoring the low frequency signal lost by narrowing of frequency band of audio signal (*signal is restored at the output of the UP-SAMPLER 8 in figure 1*), wherein the spuriously restored low frequency signal is added to the digital signal issued from the analog-to-digital converting means and the digital signal issued from the filter, and both high frequency band and low frequency band are expanded (*adder 5 in figure 1*).

5. Regarding claims 3 and 9, Ohmori et al. further disclose a device for audio frequency range expansion of claim 2, wherein the digital signal issued from the analog-to-digital converting means is rectified, the low frequency component corresponding to the tone pitch obtained by this process is extracted by the low pass filter, and the phase and amplitude of the low frequency component are adjusted to restore the low frequency signal spuriously (*LPF 9 in figure 1*).

6. Claims 4-6 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmori et al. (US Patent No. 5950153) in view of Dickopp et al. (US Patent No. 5384811) and further in view of Aguilar et al. (US Patent No. 6691082).

7. Regarding claims 4 and 10, Ohmori et al. disclose a device and method for audio frequency range expansion for generating a wide frequency band audio signal based on an input narrow frequency band audio signal comprising:

a) analog-to-digital converting means for sampling input narrow frequency band audio signal at a sampling frequency of substantially four times or more and even number multiple of upper limit frequency, and converting the signal into a digital signal (*Up-samplers 3 and 8 in figure 1 or referring to col. 4, ln. 1-23*),

b) voiced/voiceless judging means for analyzing the digital signal issued from said analog-to-digital converting means, and distinguishing a voiceless sound section not including vowel from a voiced sound section including a vowel, in the audio signal (*Affricate Detecting Unit 7 in figure 1 or col. 4, ln. 15-43*),

e) a digital adder for adding the output signal of said filter and the converted digital input signal at a specific ratio (*adder 5 in figure 1*), and

f) digital-to-analog converting means for converting a digital signal issued from said digital adder into an analog signal, and obtaining an audio signal of wide frequency band *the digital data at terminal 15 in figure 1 must inherently be converted to analog signal before it can be played to users*), and using voice/unvoiced information to control the gain of the signal (*elements 7 and 10 in figure 1*).

Ohmori et al. fail to disclose the steps: c) frequency spectrum folding means for folding frequency spectra, at the symmetry axis of the upper limit frequency of input signal towards the high frequency side, by inverting the

polarity of sampled signals on every relevant order of sample point of digital signals issued from said analog-to-digital converting means, and d) a filter for limiting the band of the output signal of said band inverting means by changing over the low pass filter characteristic to a low cutoff frequency state for the voiced sound section and a high cut-off frequency state for the voiceless sound section based on the judged result by said voiced/voiceless judging means.

However, Dickopp et al. teach the step c) frequency spectrum folding means for folding frequency spectra, at the symmetry axis of the upper limit frequency of input signal towards the high frequency side, by inverting the polarity of sampled signals on every relevant order of sample point of digital signals issued from said analog-to-digital converting means (*col. 9, ln. 1 to col. 10, ln. 67*).

Since Ohmori et al. and Dickopp et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Ohmori et al. by incorporating the teaching of Dickopp et al. in order to reproduce a wideband signal having the original sampling frequency.

The modified Ohmori et al. still fail to teach step d) a filter for limiting the band of the output signal of said aliasing signal generating means by changing over the low pass filter characteristic to a low cut-off frequency state for the voiced sound section and a high cut-off frequency state for the voiceless sound section, based on the judged result by said voiced/voiceless judging means.

However, Aguilar et al. teach a method of controlling the cut of frequency of a filter based on the voice/unvoiced decision detected by the voice/unvoiced detection unit (*col. 4, ln. 45 to col. 5, ln. 21*).

Since the modified Ohmori et al. and Aguilar et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Ohmori et al. by incorporating the teaching of Aguilar et al. in order to precisely capture and analyze voiced and unvoiced portions of the signal to enhance wideband speech quality.

8. Regarding claims 5 and 11, Ohmori et al. further disclose that the device for audio frequency range expansion of claim 1, further comprising: a low frequency expander for spuriously restoring the low frequency signal lost by narrowing of frequency band of audio signal (*signal is restored at the output of the UP-SAMPLER 8 in figure 1*), wherein the spuriously restored low frequency signal is added to the digital signal issued from the analog-to-digital converting means and the digital signal issued from the filter, and both high frequency band and low frequency band are expanded (*adder 5 in figure 1*).

9. Regarding claims 6 and 12, Ohmori et al. further disclose a device for audio frequency range expansion of claim 2, wherein the digital signal issued from the analog-to-digital converting means is rectified, the low frequency component corresponding to the tone pitch obtained by this process is extracted

by the low pass filter, and the phase and amplitude of the low frequency component are adjusted to restore the low frequency signal spuriously (*LPF 9 in figure 1*).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huyen Vo whose telephone number is 703-305-8665. The examiner can normally be reached on M-F, 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on 703-305-4827. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Examiner Huyen X. Vo

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August 12, 2004

DORIS H. TO
SUPERVISORY PATENT EXAMINER
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